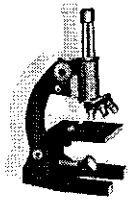
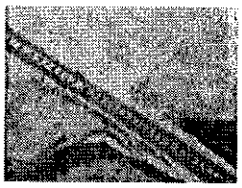


Forensic Science: Hair & Fiber Unit



Date	Classwork	Homework
Monday, 2/27	Notes: Hair & Fiber (p.1-2) Brittain's Hair & Fiber School (p.3) Microscope Review Lab (p.4-9)	
Tuesday, 2/28	Watch: NCIS "Witness" (p.3) Watch Forensic Historic Files "A Purr-fect Match" (p.10) Hair & Fiber Word Search & Crossword (p.11-12)	
Wednesday, 3/1	Hair Evidence Lab (p.13) Fiber Burn Lab (p.14) Logic Puzzle	
Thursday, 3/2	Watch Forensic Files: Convictions Overturned Within a Hair (p.15-16) Observe Hairs & Fibers Lab (p.17-20)	
Friday, 3/3	Finish Hair & Fibers Lab Watch: Bones "The X in the Files" Identify Unknown Hairs & Fibers	
Monday, 3/6	Hair & Fiber Unit Assessment	

Hair & Fiber Evidence

Name _____

Hair Biology

1. Hair is composed of the protein _____, which is also the primary component of finger and toe _____.

2. Hair is produced from a structure called the hair _____. Humans develop hair follicles during _____ development, and no new follicles are produced after birth.

3. Hair color is mostly the result of _____, which are chemical compounds that reflect certain wavelengths of visible light.

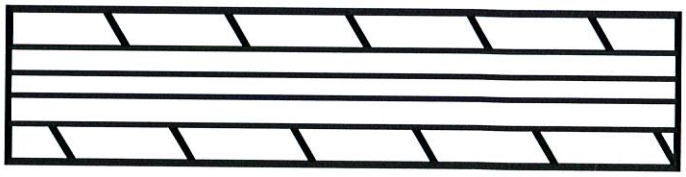
4. Hair _____ (round or oval) and _____ (curly or straight) is influenced heavily by _____. The physical appearance of hair can be affected by _____status and intentional _____ .

5. The _____ _____ (head, arm, leg, back, etc.) from which a hair originated can be determined by the sample's length, shape, size, color, and other physical characteristics.

6. In order to test hair evidence for DNA, the _____ must be present.

7. Shade in the diagram below to show the different parts of a strand of hair.

Cuticle – Yellow **Cortex** - Blue **Medulla** – Red



8. The structure of hair has been compared to that of a _____ with the medulla being the _____, the cortex being the _____ and the cuticle being the _____ on the outside.

9. The cuticle varies in its _____, its _____, and whether or not it contains _____.

10. The cortex varies in, _____, texture, and _____.

11. The medulla may vary in thickness, _____, and _____.

12. Like the cuticle, the medulla can be important for distinguishing between hairs of different _____, but often does not lend much important information to the differentiation between hairs from different _____.

Fiber Evidence

13. A _____is the smallest unit of a textile material that has a _____many times greater than its _____. A fiber can be spun with other fibers to form a _____that can be woven or knitted to form a fabric.

14. The _____and length of fiber used, the type of _____method, and the type of _____construction all affect the transfer of fibers and the significance of fiber associations.

15. Matching _____fibers on the clothing of a victim to fibers on a suspect's clothing can be very helpful to an investigation, whereas the matching of _____fibers such as white cotton or blue denim fibers would be less helpful.

16. The discovery of _____and multiple fiber transfers between the suspect's clothing and the victim's clothing dramatically _____the likelihood that these two individuals had physical contact.

Natural Fibers

17. Many different _____fibers that come from plants and animals are used in the production of fabric.

18. _____fibers are the plant fibers most commonly used in textile materials

19. The animal fiber most frequently used in the production of textile materials is _____, and the most common wool fibers originate from sheep.

Synthetic Fibers

20. More than half of all fibers used in the production of textile materials are synthetic or _____-_____.

21. Nylon, rayon, and polyester are all examples of _____fibers.

Hair & Fiber Identification Lab

Hair Samples: Think About It …

(1) In which samples are we viewing the cuticle? How do they compare?

(2) In which samples are we viewing the medulla? How do they compare?

(3) What characteristics can be used to identify hair samples?

Fiber Samples ...Think About It …

(1) Which samples are natural fibers?

(2) Which samples are synthetic fibers?

(3) What characteristics can be used to identify fiber samples?

YouTube Video: Britain's CSI School - Hair and Fibre - The One Show

https://www.youtube.com/watch?v=BjLHW7qQEI0

1. How many hairs do humans lose every day?

2. How did they collect hairs and fibers from the scene?

3. What are some differences between synthetic and natural fibers?

4. What information can be learned from a hair sample?

5. What part of the hair can you obtain DNA?

NCIS: Witness

Explain how hair and/or fiber evidence was collected, analyzed, and used to solve the case. Write 4-5 sentences.

Review of Microscope Use Lab

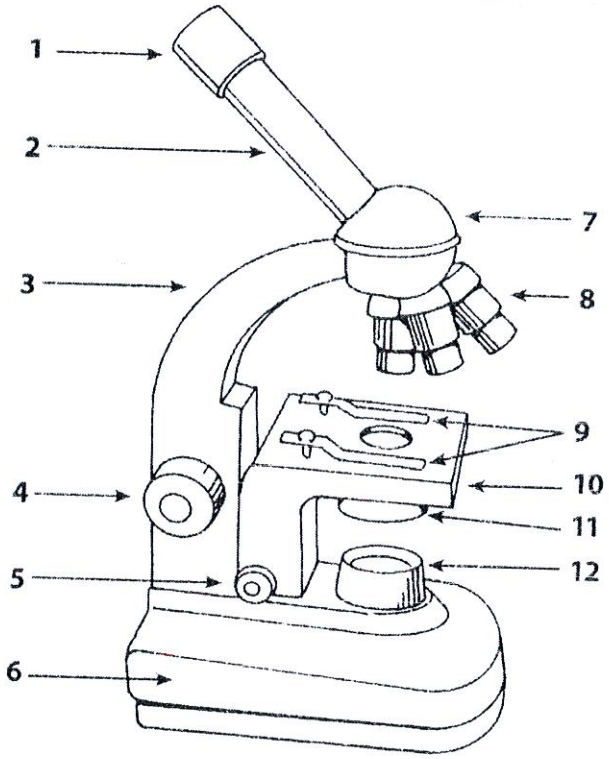
"Micro" refers to **tiny**, "scope" refers to **view or look** at. Microscopes are tools used to enlarge images of small objects so as they can be studied. The compound light microscope is an instrument containing **two lenses**, which magnifies, and a variety of **knobs to resolve (focus)** the picture. Because it uses more than one lens, it is sometimes called the compound microscope in addition to being referred to as being a light microscope. In this lab, we will learn about the proper use and handling of the microscope.

Materials

Compound microscope	Glass slides	Cover slips	Eye dropper
Beaker of water	The letter "e" cut from newsprint		Scissors

Procedures

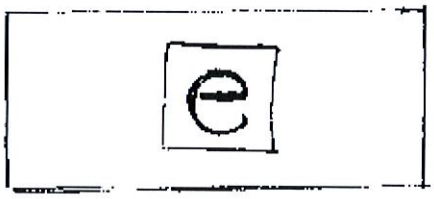
1. **Parts & Functions of a Microscope. Name the numbered parts and describe their functions in the chart below.**



	Name	Function
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

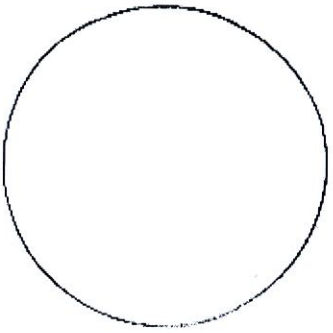
Part II. Preparing a wet mount of the letter "e".

1. With your scissors **cut out the letter "e" from the newspaper.**
2. Place it on the **glass slide** so as to look like (e).
3. **Cover it with a clean cover slip**. See the figure below.



4. **Using your eyedropper, place a drop of water on the edge of the cover slip** where it touches the glass slide. The water should be sucked under the slide if done properly.

5. **Turn on the microscope and place the slide on the stage; making sure the "e" is facing the normal reading position** (see the figure above). Using the course focus and low power, move the body tube down until the "e" can be seen clearly. **Draw what you see** in the space below.



6. Describe the relationship between what you see through the eyepiece and what you see on the stage.

_____

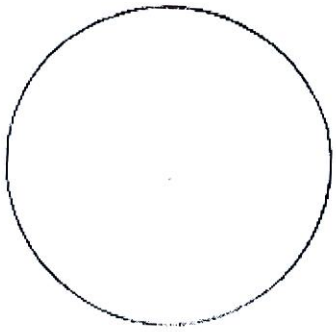
7. Looking through the eyepiece, move the slide to the upper right area of the stage. **What direction does the image move?**

_____

8. Now, move it to the lower left side of the stage. **What direction does the image move?**

_____

9. Re-center the slide and change the scope to high power. You will notice the "e" is out of focus. **Do Not** touch the coarse focus knob, instead use the fine focus to resolve the picture. Draw the image you see of the letter e (or part of it) on high power.



10. **Locate the diaphragm under the stage.** Move it and record the changes in light intensity as you do so.

_____

III. Determining Total Magnification:

1. Locate the numbers on the eyepiece and the low power objective and fill in the blanks below.

Eyepiece magnification _____	**(X)**	**Objective magnification** _____	=	**Total Magnification** _____**X**

2. Do the same for the high power objective.

Eyepiece magnification _____	**(X)**	**Objective magnification** _____	=	**Total Magnification** _____**X**

3. Write out the **rule for determining total magnification of a compound microscope.**

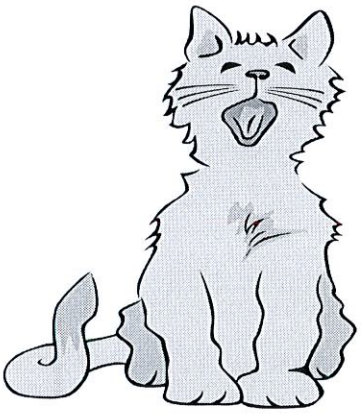
4. **Remove the slide and clean it up.** Turn off the microscope and wind up the wire so it resembles its original position. Place the low power objective in place and lower the body tube. Cover the scope with the dust cover. Place the scope back in its original space in the cabinet.

Conclusion Questions: Answer the following questions on ~~your own paper.~~ the next pg. →
Everyone must turn a lab and answers to the questions below.

1. State 2 procedures which should be used to properly handle a light microscope.
2. Explain why the light microscope is also called the compound microscope.
3. Images observed under the light microscope are reversed and inverted. Explain what this means.
4. Explain why the specimen must be centered in the field of view on low power before going to high power.
5. A microscope has a 20 X ocular (eyepiece) and two objectives of 10 X and 43 X respectively:

   a.) Calculate the low power magnification of this microscope. Show your formula and all work.
   b.) Calculate the high power magnification of this microscope. Show your formula and all work.
6. In three steps, using complete sentences, describe how to make a proper wet mount of the letter e.
7. Describe the changes in the field of view and the amount of available light when going from low to high power using the compound microscope.
8. Explain what the microscope user may have to do to combat the problems incurred in question # 7.
9. How does the procedure for using the microscope differ under high power as opposed to low power?
10. Indicate and describe a major way the stereomicroscope differs from the compound light microscope in terms of its use.

Conclusion Questions



Forensic Files: A Purr-fect Match

1. Who was the victim?

2. What was found on the shovel they found?

3. To whom, did it belong?

4. Who did her family think killer her?

5. What does a forensic podiatrist study?

6. How did they know the white hairs were not human?

7. How did the hairs help to solve the case?

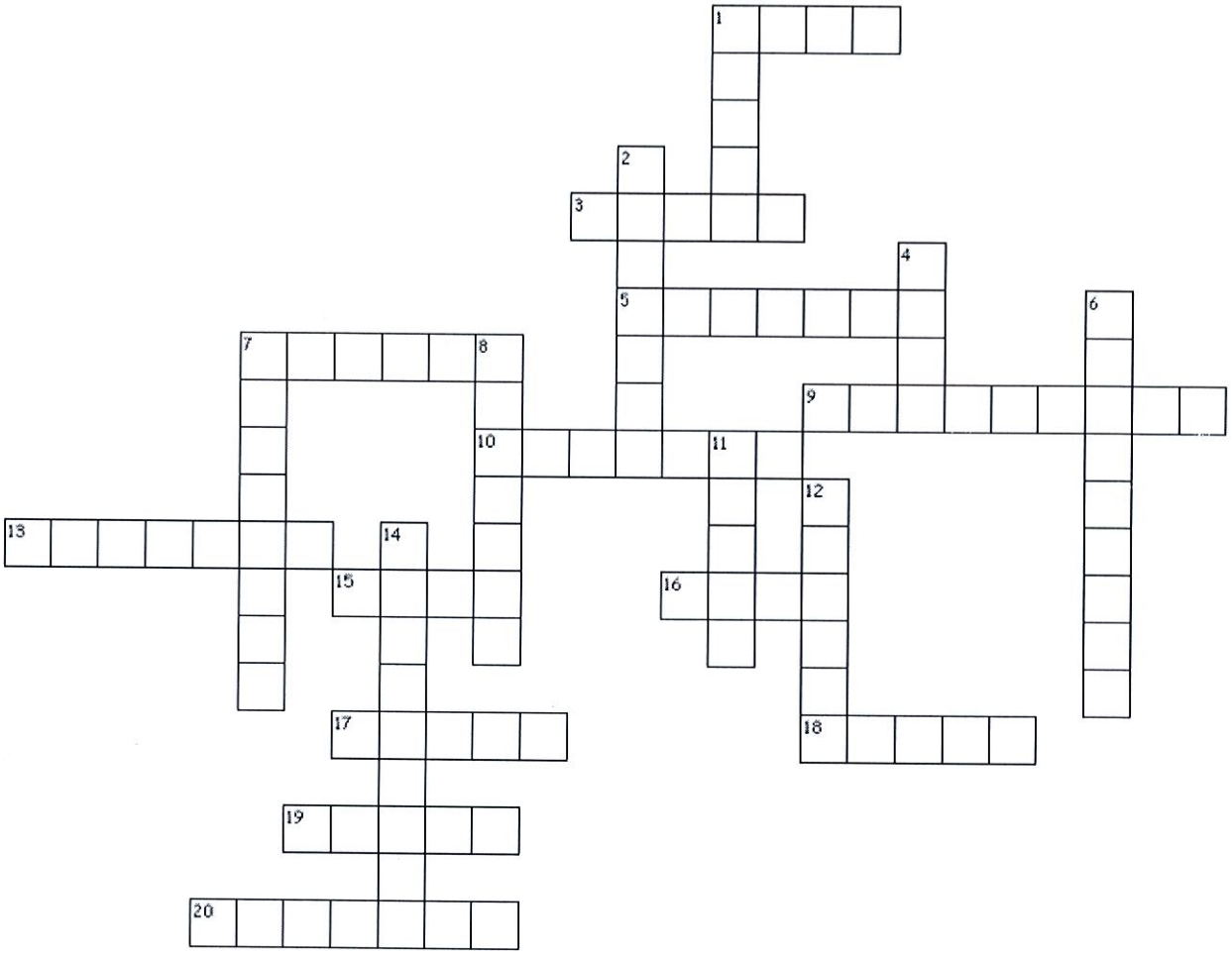
8. Who found the victim's body?

9. What was their suspect's motive?

10. What was his sentence?

10

HAIR & FIBER UNIT



Across

1. natural fiber from a worm
3. smallest unit of textile material
5. central core of hair
7. woven yarn
9. man made fibers
10. describe as curly or straight
13. protein hair is composed of
15. natural fiber used to make sweaters
16. part of hair that contains DNA
17. shape and texture are influenced by
18. synthetic fiber used in hosiery
19. follicles develop during this stage
20. fibers from plants and animals

Down

1. described as round or oval
2. gives hair color
4. spun fibers
6. impacts appearance of hair
7. hair is produced from_____.
8. outer coating of hair
11. synthetic fiber used in dressmaking
12. natural fiber from a plant
14. synthetic fiber used in 1970s

Hair & Fiber Evidence Word Search

Directions: Once you have completed the cross puzzle, find each vocabulary word in the word search below.

R L L M C G M L P M M H S R K
P E A O E M E I A B D M H E E
B C T R F D G N D T L S A B R
X I J S U M U A E R E N P I A
N T K L E T N L M S O F E F T
G E Y N U Y A E L T P O O C I
X H T D L L L N T A H P T C N
E T D O O C R O C U T I C L E
T N N O I R C O P F A B R I C
R Y W L E R U T X E T E N G L
O S L R U K H K D R V K F V R
C O L A N O I T I R T U N Y D
F N O Y A R S I L K D R M A C
O Z E L P W S H S N A A T R Y
C S D O I E K E I V A D O N D

Hair Evidence Lab

Name _____

A. Pull out a strand of your hair and examine it with a hand lens. You may need to put it on a piece of white or black paper to make it easier to see.

What does the root look like? Choose one.

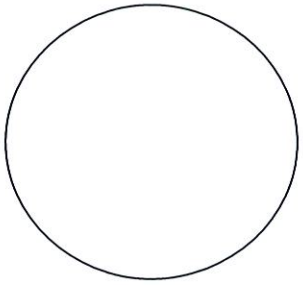
Teardrop Narrow Rounded Pointed Other: _____

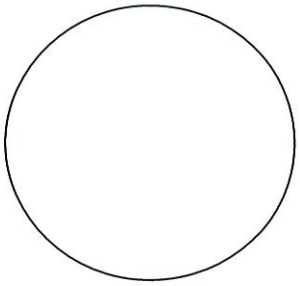
What does the tip look like? Choose one.

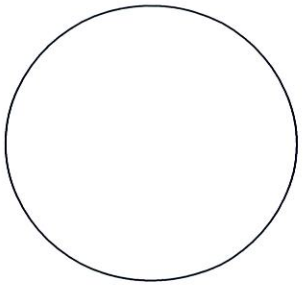
Frayed Smooth Bent Split Other: _____

What color is it? _____ Is the color the same everywhere along the shaft? _____

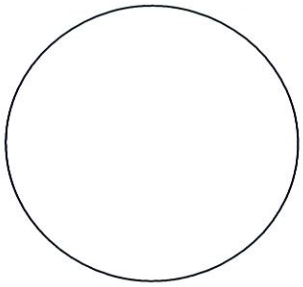
B. Place your hair on a slide and view the shaft at <u>low</u>, <u>medium</u>, and <u>high</u> power. Draw a sketch in the boxes below.

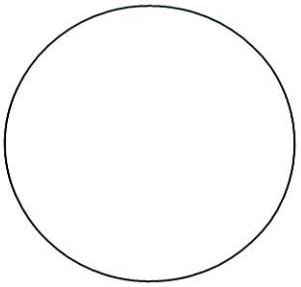
___X 

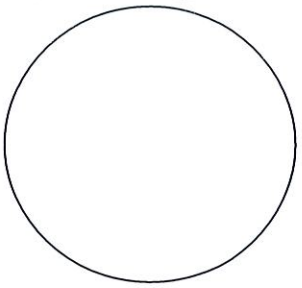
___X 

___X 

C. Place your hair on a slide and view the root at <u>low</u>, <u>medium</u>, and <u>high</u> power. Draw a sketch in the boxes below.

___X 

___X 

___X 

D. Locate the three primary structures of your hair and choose the best description for each feature.

<u>Cuticle Scales</u>	☐ Flat and smooth	☐ Protruding or spiky	☐ Other: _____
<u>Cortex Thickness</u>	☐ Thick	☐ Thin	
<u>Cortex Color</u>	☐ Same color throughout	☐ Different colors – Explain: _____	
<u>Medulla Style</u>	☐ Broken	☐ Continuous	
<u>Medulla Thickness</u>	☐ Thick	☐ Thin	
<u>Medulla Transparency</u>	☐ Transparent	☐ Semi-transparent	☐ Opaque

E. Compare your hair sample to one from a classmate. How is it similar? How is it different?

Fiber Burn Lab

Fiber	Observations
Cotton	
Rayon	
Acrylic	
Polyester	
Nylon	
Wool	

Forensic Files

Name _____

Episode Title: _____

1. What was the crime?

Type of Crime: _____

Location: _____

Time/Year: _____

Victim(s): _____

Suspect(s): _____

2. Use the chart to keep track of the evidence.

Evidence	What did it tell investigators about the crime?

More on back ▶

3. **Which pieces of evidence were most important? Why?**

4. **What was the outcome of the case?**

Hair and Fiber Samples

Name _____

Observe the hair and fiber samples provided by your teacher. Sketch the view under medium power and write a description that would help you identify the hair or fiber sample, such as unique marks or areas.

Type of Hair _____

Description:

Type of Hair _____

Description:

Type of Hair _____

Description:

Type of Hair _____

Description:

Type of Hair _____

Description:

Type of Hair _____

Description:

Hair and Fiber Samples

Name _____

Observe the hair and fiber samples provided by your teacher. Sketch the view under medium power and write a description that would help you identify the hair or fiber sample, such as unique marks or areas.

Type of Hair _____

Description:

Type of Hair _____

Description:

Type of Hair _____

Description:

Type of Hair _____

Description:

Type of Hair _____

Description:

Type of Hair _____

Description:

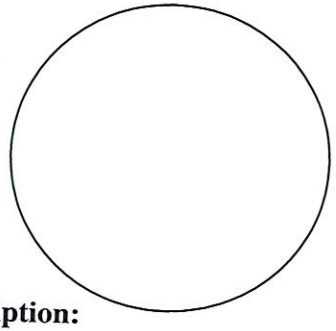
81

Hair and Fiber Samples

Name _____

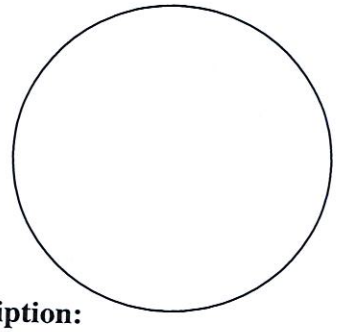
Observe the hair and fiber samples provided by your teacher. Sketch the view under medium power and write a description that would help you identify the hair or fiber sample, such as unique marks or areas.

Type of Hair _____



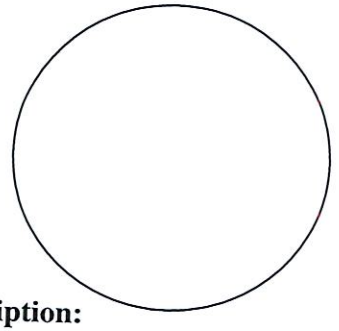
Description:

Type of Hair _____



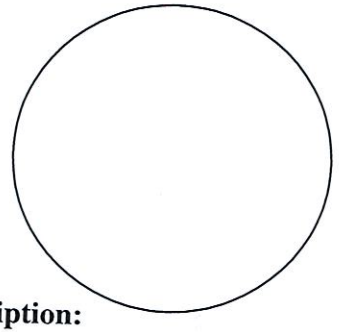
Description:

Type of Hair _____



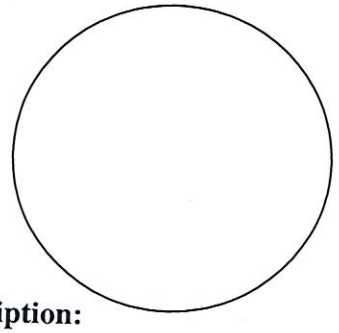
Description:

Type of Hair _____



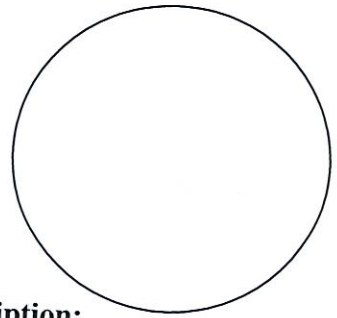
Description:

Type of Hair _____



Description:

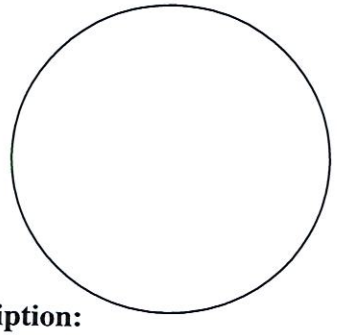
Type of Hair _____



Description:

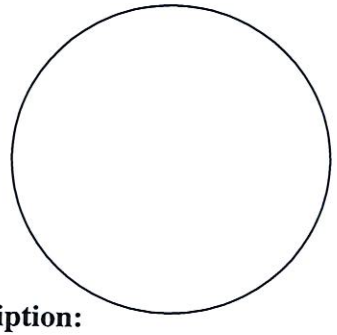
19

Type of Fiber _____



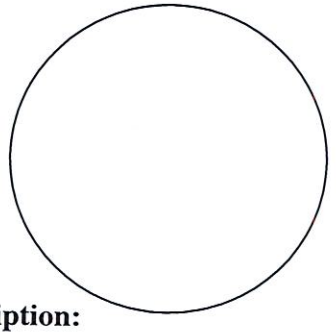
Description:

Type of Fiber _____



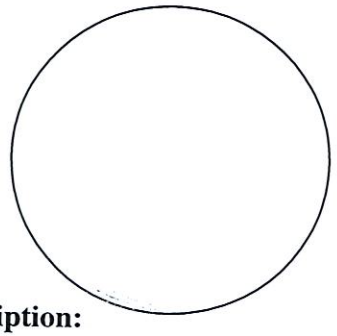
Description:

Type of Fiber _____



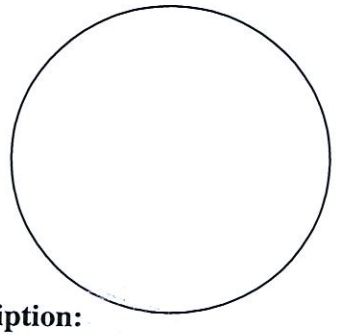
Description:

Type of Fiber _____



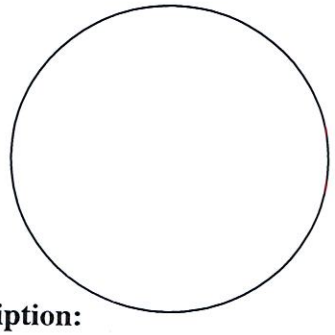
Description:

Type of Fiber _____



Description:

Type of Fiber _____



Description:

20